

ENGINEERING MATERIALS

LESSON PLAN

LECTURE NO.	TOPICS TO BE COVERED	No. of classes required
1.	Engineering materials and their properties Material classification into ferrous and non ferrous category and alloys	2
2.	Properties of Materials: Physical , Chemical	1
3.	Properties of Materials: Mechanical	2
4.	Performance requirements Material reliability and safety	1
5.	Ferrous Materials and alloys Characteristics and application of ferrous materials	2
6.	Classification, composition and application of low carbon steel, medium carbon steel and High carbon steel	1
7.	Classification, composition and application of low carbon steel, medium carbon steel and High carbon steel(continued)	1
8.	Alloy steel: Low alloy steel, high alloy steel, tool steel and stainless steel	2
9.	Tool steel: Effect of various alloying elements such as Cr, Mn, Ni, V, Mo,	2
10	Iron – Carbon system Keywords related to iron carbon diagram Concept of phase diagram	1
11	Concept of cooling curve and Invariant reactions	2
12	Iron-Carbon diagram	2
13	Iron-Carbon diagram (revision)	1
14	salient micro-constituents of Iron and Steel	1
15	salient micro-constituents of Iron and Steel(continued)	1

	Internal exam	
16	Crystal imperfections Crystal defines, classification of crystal structure, ideal crystal	2
17	Classification of crystal lattices	1
18	Crystal imperfections Classification of imperfection: Point defects, line defects, surface defects and volume defects	1
19	Types and causes of point defects: Vacancies, Interstitials and impurities	2
20	Types and causes of line defects: Edge dislocation and screw dislocation	1
21	Effect of imperfection on material properties Deformation by slip and twinning Effect of deformation on material properties	2
22	Heat Treatment Purpose of Heat treatment	2
23	Process of heat treatment: Annealing	1
24	Normalising	
25	hardening	
26	tampering	1
27	Surface hardening: Carburizing	
28	Nitriding	1
29	Effect of heat treatment on properties of steel Hardenability of steel	2
30	Non-ferrous alloys Aluminum alloys: Composition, property and usage of Duralmin, γ - alloy	2
31	Copper alloys: Composition, property and usage of Copper-Aluminum, Copper-Tin, Babbitt	2
32	Copper alloys: Composition, property and usage of , Phosphorous bronze, brass, Copper- Nickel	2

33	Predominating elements of lead alloys	1
34	Zinc alloys	1
35	Nickel alloys	1
36	Low alloy materials like P-91, P-22 for power plants and other high temperature services.	1
37	High alloy materials like stainlesssteel grades of duplex, super duplex materials etc.	1
38	Bearing Material Classification, composition, properties and uses of Tin Base, Lead base bearing materials	3
39	Composition, properties and uses of Copper base, cadmium based bearing materials	2
40	Spring materials Classification, composition, properties and uses of Iron-base and Copper base spring material	1
41	Polymers Properties and application of thermosetting and thermoplastic polymers	1
42	Polymers Properties of elastomers	1
43	Composites and Ceramics Classification, composition, properties and uses of particulatebased composites	3
44	Classification, composition, properties and uses of fiber reinforced composites	1
45	Classification and uses of ceramics	2

DEPARTMENT OF MECHANICAL ENGINEERING

POWER STATION ENGINEERING

LESSON PLAN

SL. No.	topic	No.of lectures
1.	Introduction Describe sources of energy.	2
2.	Explain concept of Central and Captive power station.	1
3.	Classify power plants	1
4.	Importance of electrical power in day today life. Overview of method of electrical power generation.	1
5.	THERMAL POWER STATIONS: Layout of steam power stations	1
6.	Steam power cycle. Explain Carnot vapour power cycle with P-V, T-s diagram and determine thermal efficiency.	2
7.	Explain Rankine cycle with P-V, T-S & H-s diagram and determine thermal efficiency, Work done, work ratio, and specific steam Consumption.	3
8.	Solve Simple Problems on Rankine cycle and carnot cycle	2
9.	List of thermal power stations in the state with their capacities.	1
10.	Boiler Accessories: Operation of Air pre heater, Operation of Economiser, Operation Electrostatic precipitator and Operation of super heater. Need of boiler mountings and operation of boiler	2
11	Draught systems (Natural draught, Forced draught & balanced draught) with their advantages & disadvantages.	2
12	Steam prime movers: Advantages & disadvantages of steam turbine, Elements of steam turbine, governing of steam turbine. Performance of steam turbine: Explain Thermal efficiency, Stage efficiency and Gross efficiency	2
13	Steam condenser: Function of condenser, Classification of condenser. function of condenser auxiliaries such as hot well, condenser extraction pump, air extraction pump, and circulating pump.	2
14	Cooling Tower: Function and types of cooling tower, and spray ponds	1

15	Selection of site for thermal power stations.	1
16	<ul style="list-style-type: none"> • NUCLEAR POWER STATIONS: Introduction Classify nuclear fuel (Fissile & fertile material)	3
17	Explain fusion and fission reaction.	1
18	Explain working of nuclear power plants with block diagram	1
19	Explain the working and construction of nuclear reactor	2
20	Compare the nuclear and thermal plants. Explain the disposal of nuclear waste.	1
21	Selection of site for nuclear power stations. List of nuclear power stations.	1
22	<ul style="list-style-type: none"> • DIESEL ELECTRIC POWER STATIONS: State the advantages and disadvantages of diesel electric power stations.	1
23	Explain briefly different systems of diesel electric power stations: Fuel storage and fuel supply system, Fuel injection system, Air supply system, Exhaust system, cooling system, Lubrication system, starting system, governing system.	3
24	Selection of site for diesel electric power stations.	1
25	Performance and thermal efficiency of diesel electric power stations.	2
26	HYDEL POWER STATIONS: <ul style="list-style-type: none"> • State advantages and disadvantages of hydroelectric power plant. 	1
27	Classify and explain the general arrangement of storage type hydroelectric project and explain its operation.	2
28	Selection of site of hydel power plant.	1
29	List of hydro power stations with their capacities and number of units in the state. Types of turbines and generation used	2
30	Simple problems on hydroelectric power generation	2
31	GAS TURBINE POWER STATIONS Selection of site for gas turbine stations.	2

	Fuels for gas turbine	
32	<p>Elements of simple gas turbine power plants</p> <p>Merits, demerits and application of gas turbine power plants</p>	2

DEPARTMENT OF MECHANICAL ENGINEERING

MECHATRONICS

LESSON PLAN

Sl.no.	Topic	No. of classes required
1.	INTRODUCTION TO MECHATRONICS Definition of Mechatronics Advantages & disadvantages of Mechatronics Application of Mechatronics	2
2	Scope of Mechatronics in Industrial Sector Components of a Mechatronics System	2
3	Importance of mechatronics in automation	1
4	SENSORS AND TRANSDUCERS Defination of Transducers	1
5	Classification of Transducers	1
6	Electromechanical Transducers Transducers Actuating Mechanisms	1
7	Displacement &Positions Sensors	5

8	Velocity, motion, force and pressure sensors	4
9	Temperature and light sensors.	2
10	ACTUATORS-MECHANICAL, ELECTRICAL Mechanical Actuators	1
11	Machine, Kinematic Link, Kinematic Pair	1
12	Mechanism, Slider crank Mechanism	1
13	Gear Drive, Spur gear, Bevel gear, Helical gear, worm gear	1
14	Belt & Belt drive	1
15	Bearings	1
16	Electrical Actuator <ul style="list-style-type: none"> • Switches and relay • Solenoid 	3
17	D.C Motors	3
18	A.C Motors	5
19	Stepper Motors	1
20	Specification and control of stepper motors	1
21	Servo Motors D.C & A.C	2

22	PROGRAMMABLE LOGIC CONTROLLERS(PLC) Introduction Advantages of PLC Selection and uses of PLC	1
23	Architecture basic internal structures	3
24	Input/output Processing and Programming Mnemonics Master and Jump Controllers	1
25	ELEMENTS OF CNC MACHINES Introduction to Numerical Control of machines and CAD/CAM	1
26	NC machines	1
27	CNC machines	1
28	<ul style="list-style-type: none"> • CAD • CAM 	1
29	Software and hardware for CAD/CAM	2
30	Functioning of CAD/CAM system Features and characteristics of CAD/CAM system Application areas for CAD/CAM	1

31	elements of CNC machines Introduction Machine Structure	1
32	Guideways/Slide ways Introduction and Types of Guideways Factors of design of guideways	3
33	Drives Spindle drives Feed drive	2
34	Spindle and Spindle Bearings	1
35	ROBOTICS Definition, Function and laws of robotics	1
36	Types of industrial robots Advantages and Disadvantages of robots	1
37	Robotic systems	2